

METHOD OF OPERATION
TRUNK CIRCUIT

Incoming From Central Test Desk - Full Mechanical Switching System.

GENERAL DESCRIPTION

1. This circuit is used as an incoming selector from a local or central test desk for testing subscriber's lines in a full mechanical machine switching system. When connected with a sender circuit in the test desk it selects a final in the same manner as a regular incoming selector. It is restored to normal when the plug of the test cord is removed from the associated test line jack previous to the test selector reaching test position. Should the plug of the test cord be withdrawn from the associated jack when the test selector switch is in testing position, the subscriber's line will be connected to the test line circuit at the test desk arranged for hook supervisor. When in the testing position, it is restored to normal by the operation of a Disc. key located at the test desk.

2. This circuit is arranged to function the "No Test" feature in the final trunk circuit when the "No Test" key in the sender circuit is operated.

DETAILED DESCRIPTION

REGULAR CONNECTION (X WIRING)

3. The plug of the test cord is inserted in the jack of the associated test line circuit and the start key operated, the fundamental circuit is closed operating the L relay. Circuit: Battery, through the 1200 ohm winding of the L relay, cam G, tip of the fundamental circuit, to ground in the test cord sender circuit. The L relay operated, locks through its 1200 ohm winding, cam H, make contact of the relay, cam G, tip of the fundamental circuit to the same ground in the sender circuit. The L relay operated advances the switch to position 2. Circuit: Ground on cam I, make contact of the relay, cam C, to battery through the R magnet. As the switch enters position 1-3/4, battery is connected through the 800 ohm winding of the PD relay, cam J to the sleeve of the associated test line circuit as a busy condition and for supervisory purposes. Due to the high resistance in the associated circuit, the PD relay does not receive sufficient current to operate at this time. In position 2, the UP magnet operates to ground on cam I through the make contact of the L relay starting the selector upward.

4. When the selector moves upward in position 2 carrying the brushes over the commutator segments, ground is intermittently connected to the tip side of the fundamental circuit through cam G by means of the A commutator brush and segments, successively short circuiting and permitting the re-operation of the stepping relay in the associated sender circuit. When sufficient impulses have been sent back to satisfy the sender, the fundamental circuit is open releasing the L relay. The L relay released, opens the circuit through the UP magnet and stopping the upward movement of the selector and advances the switch to position 3. Circuit: Ground on the armature and back contact to the L relay of cam B to battery through the R magnet.

(6 Pages) Page #2.

Issue 2 - BT-431249.

Replacing all previous issues.

October 20, 1921.

5. With the switch in position 3, the trip magnet is energized to ground on cam M and the L relay re-operates over the fundamental circuit from ground in the sender as previously described, advancing the switch to position 4. In position 4, the UP magnet re-operates and the trip magnet being operated causes the previously selected set of brushes to trip, when the selector starts upward. As the selector moves upward for group selection carrying the brushes over the commutator, ground is intermittently connected to the tip side of the fundamental circuit through cam K, this by means of the B commutator brush and segments, successively short circuiting and permitting the re-operation of the stepping relay in the sender circuit until the proper group has been selected. When sufficient pulses have been sent back to satisfy the sender, the fundamental circuit is opened, releasing the L relay which in turn opens the circuit through the UP magnet and advances the switch to position 5.

6. In position 5, the L relay re-operates through its 800 ohm winding to ground on cam D. The L relay operated advances the switch to position 6 in a circuit from ground on cam I, L relay operated, cam B, R magnet to battery. As the switch leaves position 5-1/4 the circuit through the 800 ohms winding of the L relay is opened.

7. Should the S terminal of the first final trunk in the group in which the selector is hunting be idle, the L relay releases immediately but should it be busy, the L relay is held operated in through its 1200 ohm winding, cam E make contact of the relay, cam M to ground on the sleeve of the busy trunk. While the L relay is held operated, due to this busy condition, the circuit through the UP magnet is maintained and the selector will travel upward until an idle trunk is found. When an idle trunk is found, the circuit through the 1200 ohm winding of the L relay is open but the relay does not release immediately due to a circuit being closed from ground through the C commutator brush and segment, cam D to battery through the 800 ohm winding of the relay. When the brushes are centered on the trunk terminals, the circuit through the C commutator segment is open and the L relay releases in turn opening the circuit through the UP magnet which stops the selector brushes on the terminal of the selected line. The L relay released, advances the switch to position 7 and places a busy condition on the sleeve of the selected final line. Circuit: Ground on cam H, cam I, break contact of the relay, cam M to the S terminal.

8. NOTE:- The adjustment of the C commutator brush with relation to the tripped sleeve multiple brush is such that it does not break contact with the C commutator segment until slightly after the holding circuit through the 1200 ohm winding of the L relay is opened by the sleeve brush leaving the busy terminal and making contact with the sleeve of an idle trunk. The UP magnet, therefore remains operated and the selector continues to travel upward until the brushes are carried slightly above the center of the trunk terminals allowing the locking pawl to enter the rack attached to the brush support rod. At this time the holding circuit through the 800 ohm winding of the L relay is opened at the C commutator releasing the relay. The L relay released, disconnects ground from the C commutator feed bar and releases the UP magnet, allowing the elevator to drop into place thus centering the brushes in the trunk terminals. During trunk hunting (in position 6 only), the commutator

feed ground is supplied through cams H, I and F under the control of the L relay. This is to prevent the re-operation of the L relay by the closing of a circuit between the C commutator brush and segment on the overthrow of the selector or as it drops into place.

9. As the switch enters position 6-3/4, the sleeve of the selected final trunk is made busy by ground on cam M. In position 7, the L relay operates, through its 1200 ohm winding, cam G to ground on cam M and locks through its 1200 ohm winding, cam E, make contacts of the L relay to the same ground on cam M. The operation of the L relay advances the switch to position 8. In position 8, the tip and ring are closed through cams K and R to the final circuit for selection beyond.

10. In position 8, the locking circuit for the L relay is transferred from ground on cam M to ground on the ring of the final trunk. After selection beyond has been completed, the ground on the R terminal from the final circuit is disconnected but the L relay is held operated from ground from the sender circuit over the ring. Circuit: Battery 1200 ohm winding, cam E, make contact of L relay, cam L, ring of trunk to ground. A relay in the sender circuit operates and disconnects the sender and connects the testing combination of the jacks to the incoming selector and also disconnects ground from the ring of the fundamental causing the L relay to release advancing the switch to position 9.

11. With the switch in position 9, the L relay operates through its 800 ohm winding to ground on cam H. The L relay operated closes a circuit from ground cam M, make contact of the L relay, cam C, R magnet to battery advancing the switch to position 10. As the switch advances from position 9, the L relay releases but re-operates in position 10, through its 1200 ohm winding to ground on cam D.

12. With the switch in position 10, the sleeve of the associated circuit is disconnected from the 800 ohm winding the PD relay and connected through cam J to battery through the 750 ohm winding of the SLV relay, which operates. The SLV relay operated, locks the L relay through its 800 ohm winding and the inner contacts of cam F. The L relay operated, advances the switch to position 11 in a circuit from ground on cam M, make contact of the L relay upper cam C, R magnet to battery. In position 11, the tip and ring of the circuit are connected through cams K and L to the final trunk for testing.

DISCONNECT

13. With the switch in position 11, the circuit is restored to normal, by the operation of a key at the test board. The operation of this key opens the sleeve wire, releasing the SLV relay. The SLV relay released, releases the L relay. The "L" relay released, advances the switch to position 12 from ground on the armature of the relay, cam B, R magnet to battery. In position 12 the DOWN magnet operates from ground on cam H restoring the selector to normal. As the selector reaches normal, the switch is advanced to normal from ground on the Y commutator brush and segment, cam B, R magnet to battery.

(C Pages) Page #4.

Issue 2 - BT-471249.

Replacing all previous issues.

October 20, 1921.

PRELIMINARY DISCONNECT

14. When the plug of the test cord is withdrawn from the jack at the test desk the external resistance in the sleeve circuit is decreased from 2200 ohms to 200 ohms thus operating the PD relay which locks ground on cam H. The operation of the PD relay, connects ground through cam C to battery through the R magnet advancing the switch to position 18. However if the plug of test cord is withdrawn from the jack after the switch has passed position 9, the circuit will function as previously described and the subscriber's line will then be left connected to the test desk with the switch of the test selector in position 11. With the switch in position 11, the circuit is restored to normal by the operation of a key at the test board as previously described under Disconnect.

NO TEST - ("X WIRING")

15. When this circuit is used with a central test desk located in a distant central office, the NT relay is specified and Y wiring used. In this case the fundamental circuit is closed metallic through the windings of the NT relay. When the NT key in the sender circuit is operated, battery through a resistance is connected to the ring of the test cord, after final tens selection has taken place. This battery in parallel with the battery through the 1200 ohm winding of the L relay allows sufficient current to flow in the final circuit over the R terminal to permit the P.B.X. relay in that circuit to operate after the final units selection has taken place, functioning the "No test" feature in the final circuit thus causing the mechanical apparatus to seize the called line regardless of whether it is busy or idle. As the final selector advances ground is removed from the R terminal releasing the L relay. From this point the circuit functions as previously described.

OVERFLOW

16. Should all the trunks in the group be busy, the selector when trunk hunting in position 6, travels to the top of the bank and rests on the overflow terminals. As the sleeve is open at overflow, the L relay releases, advancing the switch to position 7. With the switch in position 7, a circuit is closed from ground on the E commutator, brush and segment, cam B to battery through the R magnet advancing the switch to position 9. In position 9, the L relay is connected to the ring of the fundamental circuit as previously described under "Regular Connection" which operates in series with a relay in the sender circuit. This relay operated, before final brush selection has taken place, lights an OFL lamp at the test desk as an indication that the selector has gone to overflow. The operation of the L relay advances the switch to position 10. In position 10, the L relay again operates, advancing the switch to position 11. In position 11, the L relay is released by the operation of the disconnection key at the test board. From this point on the circuit functions and is restored to normal as described previously under "Disconnect".

TELL TALE

17. Should the selector travel to the "Tell Tale" position during brush selection, a circuit is closed from ground on the commutator brush and segment cam B, R magnet to battery advancing the switch to position 3. In position 3, the L relay operates over the tip of the fundamental circuit advancing the switch to position 4. The switch is advanced to position 5 from ground on the X commutator brush and segment. In position 5, the L relay operates to ground on cam D advancing the switch to position 6. The switch is advanced to position 7 by ground on the commutator brush and segment. In position 7, the L relay operates to ground on cam M advancing the switch to position 8. The switch is advanced to position 9 by ground on the X commutator brush and segment. In position 9, the L relay is operated over the ring of the fundamental circuit in series with a relay in the sender circuit lighting an overflow lamp at the test board as previously described under "OVERFLOW" advancing the switch to position 10. With the switch in position 10, the L relay is operated by ground on cam D advancing the switch to position 11. In position 11, the switch is advanced to position 18 by ground on the X commutator brush and segment. With the switch in position 18, the switch is advanced to position 1 and the circuit is restored to normal, as described under "DISCONNECT".

(6 Pages) Page #6.
Issue 2 - BT-431249.
Replacing all previous issues.
October 20, 1921.

CIRCUIT REQUIREMENTS

THE READJUST REQUIREMENTS SHOWN BELOW ARE FOR MAINTENANCE USE ONLY.

	<u>OPERATE</u>	<u>NON-OPERATE</u>	<u>RELEASE</u>
E138 (ST) Inner Wdg. (34 ohms)	Readj. .055 amp. Test .058 amp. W.C.C. .058 amp.		Readj. .006 amp. Test .0076 amp.
Outer Wdg. (316 ohms)	Test .042 amp.		
E375 (L) Inner Wdg. (1200 ohms)	Special requirement to avoid overstepping when hunting idle trunks. Readj. .017 amp. Test .0178 amp. W.C.C. .0184 amp.	Readj. .012 amp. Test .0114 amp.	
Outer Wdg. (800 ohms)	Test .045 amp. W.C.C. .055 amp.		
NOTE:- Relay should be equipped with special armature stop (piece part #163914).			
E618 (SLV)	Readj. .008 amp. Test .011 amp. W.C.C. .0145 amp.		Readj. .001 amp. Test .0005 amp.
Sp1.E31 D-22590 (PD) Inner Wdg. (800 ohms)	Readj. .031 amp. Test .037 amp. W.C.C. .0428 amp.	Readj. .022 amp. Test .020 amp. W.C.C. .0176 amp.	

ENG.--ACIH-ML.
6-7-22.

CHK'D.--RAP-CWP.

APPROVED - C.D.SLUYTER, G.M.L.

SECRET

TO: DIRECTOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FROM: SAC, [illegible]

SUBJECT: [illegible]

RE: [illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

9. [illegible]

10. [illegible]